Pit Quarry

SAND - GRAVEL - STONE

HANDLING - CRUSHING - SCREENING - WASHING

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Buckeye Carbide Lights Turn Night Into Day

Made in sizes from 500 to 10,000 C. P.

Does not need any special carbide; will use any commercial carbide.

Cost of running less than any other. This saving will soon pay the slight increased first cost.

Try one against any other. That's all we ask!

Ask for Catalog A-P

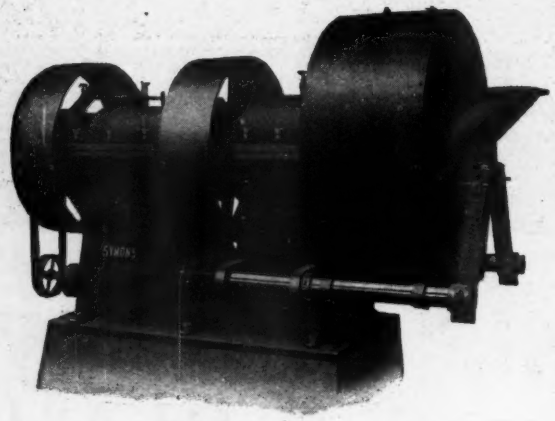
The Macleod Company

Bogen Street **Cincinnati, Ohio**

JANUARY, 1918

Table of Contents - - Page 17
Index to Advertisements - Page 17

Symons Disc Crusher



THE IDEAL CRUSHER FOR GRAVEL, SAND, ROCK

Large Capacity Uniform Size.

In Operation in Nearly Every State

BUILT IN FOLLOWING SIZES.

Size	18 inches	Capacity	5 to 15	Tons	Per	Hour
"	24 "	"	12 to 30	"	"	"
"	36 "	"	25 to 65	"	"	"
"	48 "	"	45 to 120	"	"	"

Simons Pulsating Screens

HALF THE COST OF A REVOLVING SCREEN

Larger Capacity
Less Repairs
Less Floor Space

MANUFACTURED AND SOLD ONLY BY

CHALMERS & WILLIAMS

1500 ARNOLD STREET

Chicago Heights, Illinois

Pit and Quarry

Vol. 2 JANUARY, 1918 No. 2

Remarkable Efficiency in Twin Crushing Plant

Duplicate Equipment and Labor-Saving Features Reduce Operating Costs to the Minimum.

IN DETROIT is one of the largest stone crushing establishments in the country, a plant made possible by conditions, being a subsidiary of the Dunbar & Sullivan Dredging Company, Buffalo, N. Y. It is that of the Dunbar Stone Company, Detroit, and was erected to handle the limestone taken from the Detroit river by the dredging concern in its ship channnel operations. The material thus obtained belongs to the contractor by government provision and large quantities of it have accumulated since the dredging company began in 1845. This material is piled up in the Detroit river sometimes to a height of 200 feet above water and consists of stones weighing 12 tons down to rocks of only a few ounces. Much of it contains considerable dirt and provision is made at the crushing plant for eliminating this.

For bringing the stone to the crushing plant, a distance of about 17 miles, the company has a fleet of seven scows capable of handling 700 tons at a load, although each scow averages about 520 tons. They are towed to the plant in pairs and unloaded at the rate of two, and sometimes three, a day.

Plant is in Duplicate

The plant is erected on a monolithic concrete foundation on piles going down 80 feet to bed rock. It is built in duplicate and is electrically operated throughout, having circuit breakers so situated that any part of it can be cut out as desired. It obtains power in the quantity of 4,600 volts over silk protected cables, and after using what is required for its own operation sells current to neighboring institutions. There is a sprinkler system operated by dry valve, kept warm in winter by electric lamps. Pumps reclaim oil, which is filtered and used again. The plant usually

Dunbar's Delivery Service Is an Important Feature of the Business. Frequently an Entire Carload of Crushed Stone, Filling Five Trailers, Is Hauled Over Detroit Streets.

PLANT AND STORAGE YARD OF THE DUNBAR STONE COMPANY, DETROIT, MICH.

operates until Christmas. Throughout it is equipped with labor-saving machinery and makes a feature of its delivery system. The latter is illustrated by one of the pictures, a train load of stone passing over a city street being rather an unusual sight.

HUGE CRUSHERS BREAK UP BIG STONE

The stone is removed from the scows by a crane of the company's own design, manufactured by the American Hoist and Derrick Company, St. Paul, Minn. It is on steel foundations and a 1½-inch cable from its drums moves the scows forward by means of a pulley on a dead man some distance up the Rouge river, on the south bank of which the plant is situated. The crane is of the whirler type and carries a 3-yard skip, made by Whitehead & Kales, of Detroit, and also of Mr. Dunbar's design. Swinging lines draw the skip over and dump its contents into 40-ton Edison rollers making 165 revolutions a minute, operated by independent 200 h. p. motors. Plugger plates for these rolls usually last one season. These rolls are set 9 inches apart for the reason that in the raw material are often manganese steel dipper teeth and other pieces of metal dropped during previous dredging operations, which would do irreparable damage to the rolls if they were not set wide enough apart to allow such obstructions to pass through.

OXY-ACETYLENE TORCH REMOVES OBSTRUCTIONS FROM CRUSHER

A pan conveyor brings the material from the rolls up to the mouth of a No. 9 Gates crusher (Allis-Chalmers), 23 feet above. The dipper teeth referred to of course go into this crusher; but when this happens a belt is thrown off and the tooth is cut out by an oxy-acetylene torch. The repair department has become expert in the handling of oxy-acetylene and have learned to burn out such obstructions within a few minutes.

The stone is then chuted to a 6-foot Stephens-Adamson scalping screen, that takes out the material that does

STONE IS UNLOADED FROM SCOWS INTO THE CRUSHER ROLLS AT THE LEFT.

not have to be crushed; that is, up to 1½ inches. The material passing this screen is dropped onto two cross conveyors running in opposite directions from the rotary scalping screen, one a belt handling the larger stones and the other on "iron man," or scraper conveyor, for handling the finer and wetter materials. These materials are then carried by two 28-inch conveyor belts parallel to and on either side of the screen, and these in turn deliver to the main conveyor belts leading to the top of the screening and washing plant.

SIMPLE CONTRIVANCE EFFECTS GREAT SAVING OF BELT

The oversize from the scalping screen is elevated by a 36-inch belt and bucket elevator (Stephens-Adamson) to bins above, feeding four No. 5 crushers (two Gates and two Austins), driven by independent motors, which turn out material 2 inches and smaller. It is at this point that a great saving of belt has been effected by a simple arrangement. The coarser materials from these No. 5 crushers fall upon the finer materials previously mentioned as having passed through the 6-foot screen and traveling upward to the main conveyor belts. The illustration shows how this is accomplished. The fine material as it passes from the 36-inch belt to the main conveyor belt strikes a steel plate with a glancing blow and is thrown onto the main conveyor belt with little impact, because of the steel plate having taken up the most of the shock. Thus it acts as a cushion for the heavier materials which fall on top of it, bringing the wear on the belt to a minimum.

HOW DIRT IS REMOVED

Two 28-inch Leviathan (Main Belting Company) belts carry the two grades of material up a 20 per cent incline 220 feet long to the screens and washers. The screening department consists of four 4 by 22-foot Stephens-Adamson washing screens with

(Continued on page 75)

Safeguarding Quarries

NOTE: Mr. Croll's address is reproduced in full as delivered before a recent meeting of the National Safety Council. Its practical character created much interest and evoked considerable discussion. It is regrettable that insufficient space prevents more than the publishing of a few of the more important questions and answers.

WE CONSIDER the quarries one of the most hazardous departments of our industry, and consequently have taken special precautions and adopted special rules to prevent accidents. These rules and regulations relate to the different operations in the quarry, the handling of dynamite, the storage of the same, the loading and shooting of holes, the protection of employes from slides of rock as well as the safeguarding of such machinery as is in use.

By A. J. CROLL,
General Superintendent, Atlas Portland Cement Company

The Foreman

The best protection the quarry employe can have is a careful and competent foreman.

THE care of dynamite begins upon receipt of the car at the plant. When the car is received, the seals are checked and compared with shipping notice. After this the dynamite is stored in concrete magazines and kept under lock and key until used. The same man is always in charge of the magazine, and no strangers are allowed anywhere near it.

A record is kept of the dynamite taken from the magazine, and this is compared with the blasting foreman's record of the dynamite used in order to check the amounts; any dynamite drawn from the magazine and not used by the blasters is returned. We have our magazines, as well as the thaw-houses, surrounded by earth embankments. The men unloading cars or working in the magazines are required to at all times wear rubber shoes, which are provided for this purpose.

Storing Dynamite

Dynamite is never stored or left in the same building with caps, exploders or fuse. In cold weather, when it is necessary to thaw dynamite, it is thawed in separate houses built for that purpose, and the employes are not allowed to thaw it in any other way. The thawing houses are kept at a temperature below 100° F. Our rules for opening dynamite boxes require that they be not opened in the powder magazine, and that they be opened by the use of a wooden wedge and a wooden mallet which are supplied.

Transporting to Drill Holes

In transporting the dynamite from the magazines or thawing-houses to the drill-holes it is required that the boxes be so packed that there can be no movement or shifting in the wagon or cart, and in no case are the em-

ployes allowed to carry caps, exploders, or fuses at the same time they are handling dynamite. Smoking or the carrying of matches while handling dynamite is strictly prohibited.

Preparing for the Blast

In preparing for a large blast, which consists of the shooting of a number of well-drill-holes, careful preparations are made to protect all employes. No one is allowed in the danger zone of the quarry floor. Before charging the holes they are examined to be sure that there are no loose stones or earth above that are likely to fall.

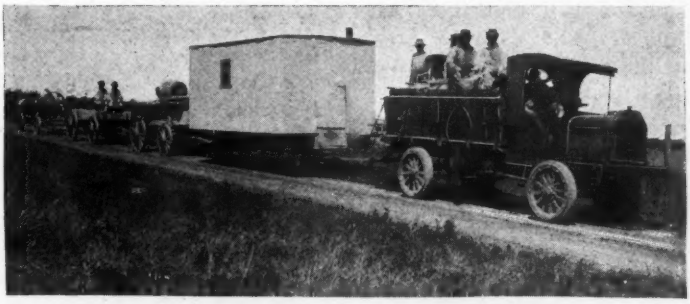
In loading holes no more men than are necessary are used in the powder gang, and the same men are used at all times for this purpose.

In tamping the dynamite in these deep-well drill-holes, nothing is used but a wooden pole. This pole is free from nails and from any iron or steel, and is kept clean and free from grit and gravel. When the pole is brought up out of the hole, it is rested on a canvas pad one inch thick. The holes are tamped by pressing on the tamping pole and not by ramming. When we are through loading, all dynamite left is returned to the magazine.

In inserting exploders into cartridges we open the paper at one end and insert a pencil-shaped piece of wood, then put in the exploder, pull the paper around it, and tie it with a string. This we consider very necessary to prevent misfiring.

In getting ready to fire, the lead

One Job Finished—On to the Next



HAULAGE cost is one of the biggest factors in road construction, particularly where materials have to be hauled any considerable distance. The advantage of motor hauling, as compared with horse or mule hauling, has been demonstrated by thousands of remarkable examples.

The road commissioners of a county in Iowa report that since their Duplex truck replaced their horse and mule teams, haulage costs have been cut squarely in two, with a saving in time of no mean importance.

The photograph reproduced above was taken after the completion of one job ahead of scheduled time, and shows the entire equipment being hauled to another job. The truck is loaded with gravel, with a quantity of tools and four passengers as good measure. To the trucks are attached a bunkhouse, weighing 5,500 pounds, a tank wagon weighing 1,500 pounds, a wagon carrying two men and weighing 1,500 pounds, and a concrete mixer weighing 1,500 pounds. In all, the total weight of vehicle and loads was 14,700 pounds.

wires are never connected with the exploders until we are ready to make the blast. In connecting the exploder wires, we see that all joints are secure and well made, and insulating tape is used on the connections and bare spots. The batteries are not connected until the signal for the blast has sounded and all the men are in a place of safety.

Before any shot is fired, a signal is sounded consisting of a certain number of blasts of a whistle. The number of blasts of the whistle indicates the location in the quarry at which the shot is to be fired, these signals being known to all the quarry employees. In case the quarry is near a public road, men are sent out to notify the public.

After the blast is shot it is required that the blasting foreman make an examination to see that all the shots have been fired, and that there has been no misfire, and until he gives the signal the men are not permitted to leave their places of safety.

It is the duty of the foreman to see that the pile of rock is safe at all times and that it is not undercut. This is to afford protection to the men against slides of rock.

General Protective Measures

The machinery used in connection with the quarry is guarded in the usual manner, all gears and moving parts being protected. No strangers are allowed in the quarries, and fires are very carefully guarded against. No blasting is done in our quarries except between sunrise and sunset, and at no time on Sunday.

In conclusion, I would say that every precaution is taken in our quarries to prevent accidents. We believe that as few men as possible should be exposed to danger in the handling of explosives, and that only men thoroughly familiar with the same should be allowed to handle them. The men should be taught that dynamite or other explosives are dangerous, and that they should be handled accordingly. We tell our men to handle dynamite as they would a box of eggs which they owned and did not wish to break.

We believe that the best protection the quarry employe can have is a careful, conscientious and competent quarry foreman and quarry superintendent.

* * *

Discussion

Q.—What method do you use for thawing dynamite? You say you use a thaw house?

A.—Yes, hot-water heat from outside the house.

Q.—Do you get outside heat from your plant?

A.—No, from a separate boiler which supplies heat for the thawing house only.

Q.—How do you load your deep holes? How do you get your dynamite down to the bottom? Do you lower it or just drop it?

A.—We drop it down.

Q.—If you do block-holing, what practice do you require of a man doing that work, in carrying his explosives with him, with caps and with fuses, and in the cutting of cartridges to a suitable size?

A.—We do very little block-holing that requires less than a stick, as we load entirely by steam-shovel. It is only very large rocks that are block-holed. It is not good practice to let the man that carries the dynamite also carry the exploders.

Cost Keeping for Quarries

Outlining the General System of Keeping Costs with Particular Attention Given to Items Not Usually Figured Into the Selling Prices

In a former article the general outline for cost keeping in quarries of all kinds was given, showing three general headings and the numerous subdivisions. It is proposed to discuss these headings and all the subdivisions in this series so as to place the entire subject in a simple, yet effective, manner before the reader.

By D. J. HAUER

AGGREGATE costs or expenses of a day's operation mean little. Such cost keeping is better than none, but with about the same labor proper costs can be kept that will mean efficient management. The basis of such costs should be some units of measurement. These units must be understood before any definite system can be devised, and they will depend upon the kind of quarry being worked. It is hardly possible to enumerate all kinds of quarry operations, but the principal ones covered by this journal are as follows:

1. Crushed stone.
2. Lime quarries.
3. Cement quarries.
4. Rough stone (rip rap, dimension stone).
5. Blue stone (flags, etc.)
6. Slate quarries (slabs and roofing).
7. Paving blocks and curbs.
8. Building and ornamental stone.
9. Marble and onyx (for interiors and exteriors).
10. Feldspar and minerals.
11. Phosphate and commercial products.

[Editor's Note—Any omissions noticed by readers of this journal should be sent to the editors so as to include the quarries in future discussion and articles.]

COSTS should be segregated and analyzed daily if wastes are to be eliminated promptly. It does not help to know that money has been lost at the end of a season, or after a large contract for furnishing stone has been finished. It is too late then to make changes that might have saved such losses. It is possible to give actual examples of how a modern cost-keeping system has so reduced the cost of producing stone as to change an operation from an unprofitable to a money-making proposition.

Units of Measurement

The units of measurement in these various quarries may differ somewhat in the several states and provinces of this country and Canada, but those in general use for Nos. 1, 2 and 3 are the ton, generally the short ton of 2,000 pounds; for No. 4, the ton or the cubic foot or cubic yard. Small-sized stones of this character are sold in some sec-

tion by the perch. The products from Nos. 5 and 6 are sold either by the square foot or the piece or number of pieces, as hundred or thousand. For No. 7, paving blocks are sold by the hundred or thousand, while curbing is sold by the lineal foot, the dimension faces being considered. For Nos. 8 and 9 the units are either the cubic or square foot, depending upon the use to which the products are feet. The ton is used for the quarries mentioned under Nos. 10 and 11.

In some of the cases where the ton is used as the unit there can be two units of measurement, the unit as the stone comes from the quarry, or the unit of the finished product, as in producing lime or cement. In such cases records must be kept to prevent confusion.

(Continued on page 76)

Helping Uncle Sam

FROM the fact that the railroads are all overburdened with transportation, many of the country's leading business executives are installing motor trucks on interurban services. Several such routes have already been launched and proven to be successful in delivering merchandise up to 100 miles. Regular schedules are being maintained, and a number of handling costs incidental to rail shipment have been eliminated. For instance, in shipping by motor trucks the freight from city to city goes direct from the loading point to the point of delivery, which avoids the cost of handling from railroad cars.

Heavier materials, such as sand, gravel and crushed stone, if shipped short distances by motor trucks would release a vast number of freight cars so urgently needed by the government. It has even been suggested that an embargo be placed on the small freight shipments for short hauls. At the present time, with Judge Lovett's Priority Order No. 2 prohibiting the use of open-top cars, road material men will undoubtedly turn to the motor truck. This is what Contractor Porath is doing. He keeps a fleet of Standards going from bins to job and is able to finish up his contracts despite Judge Lovett's decree.

Stripping Costs

There are a large number of methods of stripping quarries, and unfortunately many are entirely too expensive. This work is sometimes done weeks, months and even years ahead of the actual quarrying, which means that costs applied to daily unit measurements are not those of the present, but of the past; yet such costs, even if the money has been previously spent, are true ones and should count against the daily operations.

Measuring Rock to Be Quarried

To apply such costs it becomes necessary to establish a ready means of measuring the rock in place to be quarried. This can easily be done by establishing a base line in the quarry, either on the quarry floor or on top of the ledge, so that lines can be run off of it and elevations taken of cross-sections of the ledge. Then there is no guesswork as to the quantities of rock excavated, but actual quantities can be calculated with little trouble. This is an important subject that cannot be dismissed in a few words and will be taken up in another article at a later date.

Cost keeping must be based upon exact knowledge, and the basis should be the unit of measurement adopted for selling the quarry product. The cost of stripping must be figured upon such a basis, and such costs will not show in the expenses of daily operations, but must be applied to the daily costs when they are analyzed and calculated. It is not possible to discuss many of the details of cost keeping as to stripping, but much more can be understood when the methods of stripping are taken up in the February issue.

Stripping if done ahead of the quarrying is almost like a capital expenditure charge, but if the stripping is done along with the quarrying then it must be treated as a daily expense. As a rule, though, this method of stripping is the most expensive, as it generally means that most of the overburden is shot down with the blasts.

Quarry Arrangement and Improvement

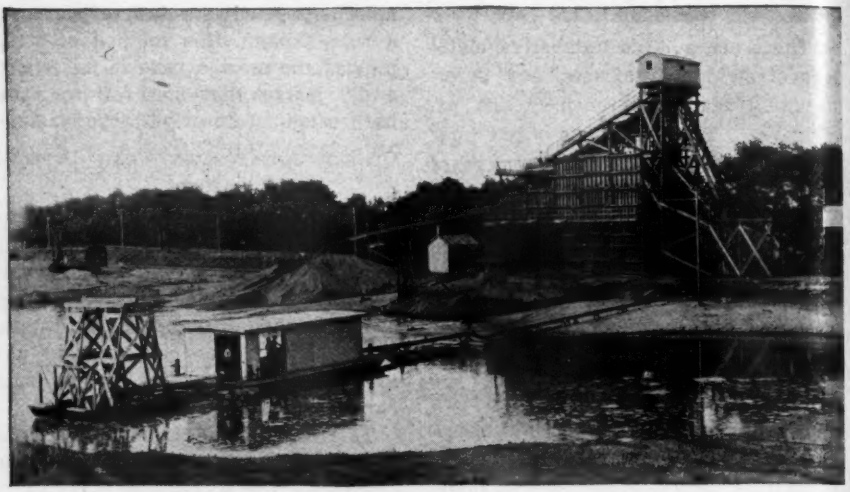
The cost of quarry arrangement and improvement should be like stripping —a charge that should remain constant for long periods. It is not possible to have it as a direct capital charge, for it does not include any plant, although it has to do with changes of the quarry plant.

This cost should include the track work, the charging of the derricks and cableways, the laying and relaying of pipe lines for air, steam or water, and the putting up and charging of electric wires.

Thus there are two charges in this connection—the original cost of this work and the cost of changes, additions and improvements. There may also be certain improvements to the quarry itself, as runways, inclines and other necessary things. Such costs must be distributed over the yardage that is to be excavated, and not the amount taken out each day, otherwise the cost would be excessive.

Pumping

It would seem that the cost of pumping should be included in the cost of operation, and if only a limited amount of pumping must be done this would be the logical method; but in many quarries pumping must be done continually day and night, and even when the quarry is not being worked. If the charge was made on a daily basis, it would be small one day and excessive the next. For this reason pumping must be included in these general costs or charges, but it cannot be handled in the same manner as the four other items under the heading of development, for they can be charged



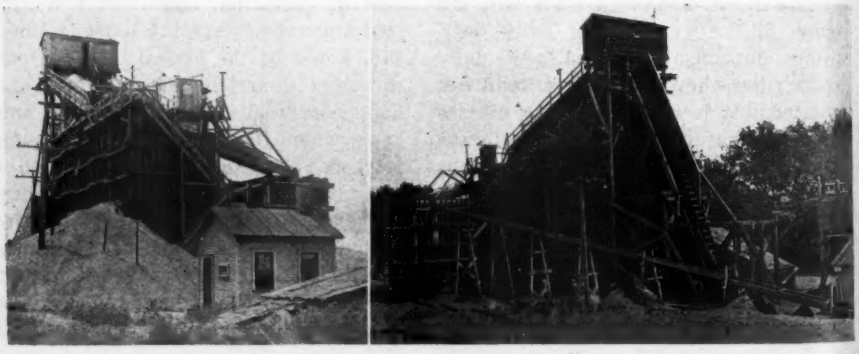
MATERIAL AT THE NORTHERN GRAVEL COMPANY'S PLANT IS PUMPED TO A DEWATERING SUMP AND HOISTED TO THE SCREENS BY A DIGGING ELEVATOR.

Hydraulic Equipment Handles Fine Material

Material runs rather fine at the plant of the Northern Gravel Co., Muscatine, Iowa, about a mile from the Mississippi river. Approximately 60 per cent sand and 40 per cent gravel, with a few stones over 3 inches, is the average run. The company has unlimited quantities and its plant is capable of a big output, 1,200 yards daily.

The plant is electric-driven throughout and obtains material by the hydraulic process, by means of a 10-inch Morse centrifugal pump mounted on a scow, which discharges into a dewatering sump through a pipe line now about 1,000 feet long. The first taking in of material is about 90 per cent solids and 10 per cent water.

An inclined digging elevator 70 feet long centers and, carrying 18 by 30 by 15 inch buckets, lifts the material



TWO VIEWS OF THE NORTHERN GRAVEL COMPANY'S PLANT AT MUSCATINE, IA.

from the dewatering sump and delivers it into rows of standard inclined conical screens, three screens to a row.

The over-size goes into the first bin, from which it is spouted into a 36-inch Symons disc crusher in a small house adjoining the screening and washing plant. After crushing, it again goes to the dewatering sump and is reëlevated on the inclined digging elevator previously mentioned.

Separation of the sand is done by means of two special squirrel-cage screens and Dull conical sand separators. These squirrel-cage screens are driven from the end of the screen shaft. There is an extra sand bin alongside the plant and just across one of the loading tracks. When it is filled, a 6-inch pump delivers the sand from it to storage piles through the flume shown in one of the pictures.

All of the motors were furnished by the General Electric Co. The plant was designed by the Raymond W. Dull Co., of Chicago.

Weight of Broken Stone

WHEN BROKEN stone is bought from a manufacturing company and shipped by rail, or otherwise, it is frequently sold by weight. Before estimating the cost of a road when the stone is to be paid for by weight, the road official must know how much the stone will weigh per cubic yard. To dispel the somewhat general impression that all stone weighs the same per unit of volume and that a cubic yard of broken stone always weighs a ton and one-third, the specific gravity and weight of a number of different kinds of rock are given in the accompanyng table.

The weights are of solid rock. If it be assumed that the volume of the stone after it is crushed and as it lies in the bins has 50 per cent of voids, and the average weight of peridotite is compared with the average weight of limestone, it will be seen that crushed peridotite weighs 1.43 tons to the cubic yard, while the limestone weighs only 1.11 tons. The heaviest diorite weighs 1.41 tons to the cubic yard and the lightest only 1.13 tons. Differences as marked as these will be found in the different stones referred to in the table.

After broken stone has been carried for some distance on the cars or in carts it packs, and a given weight will not occupy so much space as before it began its journey. In contracting for stone by the cubic yard the place of measurement should always be agreed upon in advance.

Number of samples tested.	Name	Specific gravity.			Weight per cubic foot of solid rock.			Weight[a] per cubic yard of solid rock.		
		Max.	Min.	Av.	Max.	Min.	Av	Max.	Min.	Av
					Pounds.	*Pounds.*	*Pounds.*	*Tons.*	*Tons.*	*Tons.*
3	Peridotite (trap)	3.55	3.25	3.40	221	203	212	2.984	2.741	2.862
124	Diabase (trap)	3.20	2.60	2.95	200	162	184	2.700	2.187	2.484
33	Diorite (trap)	3.35	2.70	2.85	209	168	178	2.821	2.268	2.403
60	Schist	3.20	2.65	2.90	200	165	181	2.700	2.227	2.443
11	Felsite	2.80	2.50	2.65	175	156	165	2.362	2.106	2.227
53	Quartzite	3.10	2.50	2.70	193	156	168	2.605	2.106	2.268
358	Limestone	3.10	2.00	2.65	193	125	165	2.605	1.687	2.227
106	Granite	3.00	2.00	2.65	187	125	165	2.524	1.687	2.227

[a] Tons of 2,000 pounds

EDITORIAL

Progress

THE CONTENTS of this issue are principally devoted to industrial progress.

The past year has registered progress in knowledge—in methods and machinery.

To recognize and advocate new machinery and improved standards of operating practice is the essence of future progress.

Therefore, this number has been designated the Progress Number. The men who have contributed to its columns are eminently qualified, by close study and experience, to examine their respective subjects and to write their interesting and helpful conclusions.

Space does not permit of the description of every labor-saving machine of recent development. Only those of special prominence are described, where authentic descriptions have been available.

What of the Future?

WE MUST not be pessimistic at this time. Future business conditions, as far as it is humanly possible to foresee them, do not warrant that feeling, unwise priority orders and the inability of the railroads to handle freight with any degree of efficiency notwithstanding.

It may seem that being deprived of open-top freight cars might compel a large number of pit and quarry owners to shut down their plants, but fortunately the blow is not so forceful as it would have been if delivered earlier in the season. The order came just at the approach of winter and materially interfered with closing up certan contracts, but by spring conditions may be so changed that business in the material industry may be normal.

When we first started in this world-wide war the doctrine "Business as usual" was preached. Then it was found that the government, in the wonderful work it has performed in preparing the country for the part it is to play in the war, had to put government work ahead of all industrial operations, so the program of business as usual had to be ignored. Business men of every class have acquiesced in this and the spirit of all "doing their bit" has been pleasing.

There is some indication that Priority Order No. 2 may be modified soon so as to permit the delivery of material for the building of necessary roads. Some of the members of the various war boards recognize road building as a great national need and regard the order as being subject to modification as real conditions are put forth.

Stone, sand and gravel will be needed in the spring for much work that the government must do. Should the order stand unchanged, motor trucks will, no doubt, be used extensively for the delivery of such products up to a radius of fifty miles, and this distance may be considerably extended.

One of the great questions to be thrashed out this winter, both by congress and the executive branches of the Federal government, will be the determining of what lines of business are essential to the progress of the country and early success of the war, and what industries are not of first importance in this respect. This will be difficult to solve, for it is even

claimed by some that the making of jewelry is essential, as much of it is shipped to neutral countries, thus balancing freights and bringing in return materials necessary to the successful carrying on of the war.

Probably one of the acts of great moment is the taking over of the railroads by the government.

The report is that labor officials are prepared to assure the president that they will loyally support the government and that a satisfactory adjustment over wages can be made without embarrassment to the government's management of the roads. It is not unlikely that a slight increase in pay will be agreed to by the government and these officials.

The president has no power to arbitrarily fix the compensation of the carriers, and this compensation cannot be arbitrarily fixed by congress, so it is necessary, administration advisors say, that, unless the roads voluntarily agree upon a plan, the compensation must be adjudged by an independent tribunal.

Powder Magazines

IN A FEW states wooden powder magazines are still allowed. One prominent quarry man told the editor recently that he was using a wooden shed of simple construction, built like a powder mill, with the ends left open. "If there is any explosion going to take place," he said, "we are going to let it go. It would lift the roof, throw the sides down, and there is the end of it."

Most states require powder magazines to be fire-proof and bullet proof. The Bureau of Mines conducted experiments and found that the cement mortor magazine, made with a 1:3 mix, using a fairly fine gravel as aggregate, was almost entirely disintegrated by the force of the explosion, so that no large fragments were thrown.

The concrete magazine is rightfully recommended, because it is fireproof, water-proof and bullet-proof. Some dynamite might explode, and other dynamite might not explode, under presumably the same conditions. Some dynamite, as has been facetiously remarked, explodes when you look at it; some dynamite explodes when you don't look at it at all—just because at the psychological moment it lets go.

In this manner a serious condition is sportively described. More sober reflection will reveal the fact that the best protection for dynamite is none too good. A wooden powder magazine is a dangerous thing to have around a stone plant.

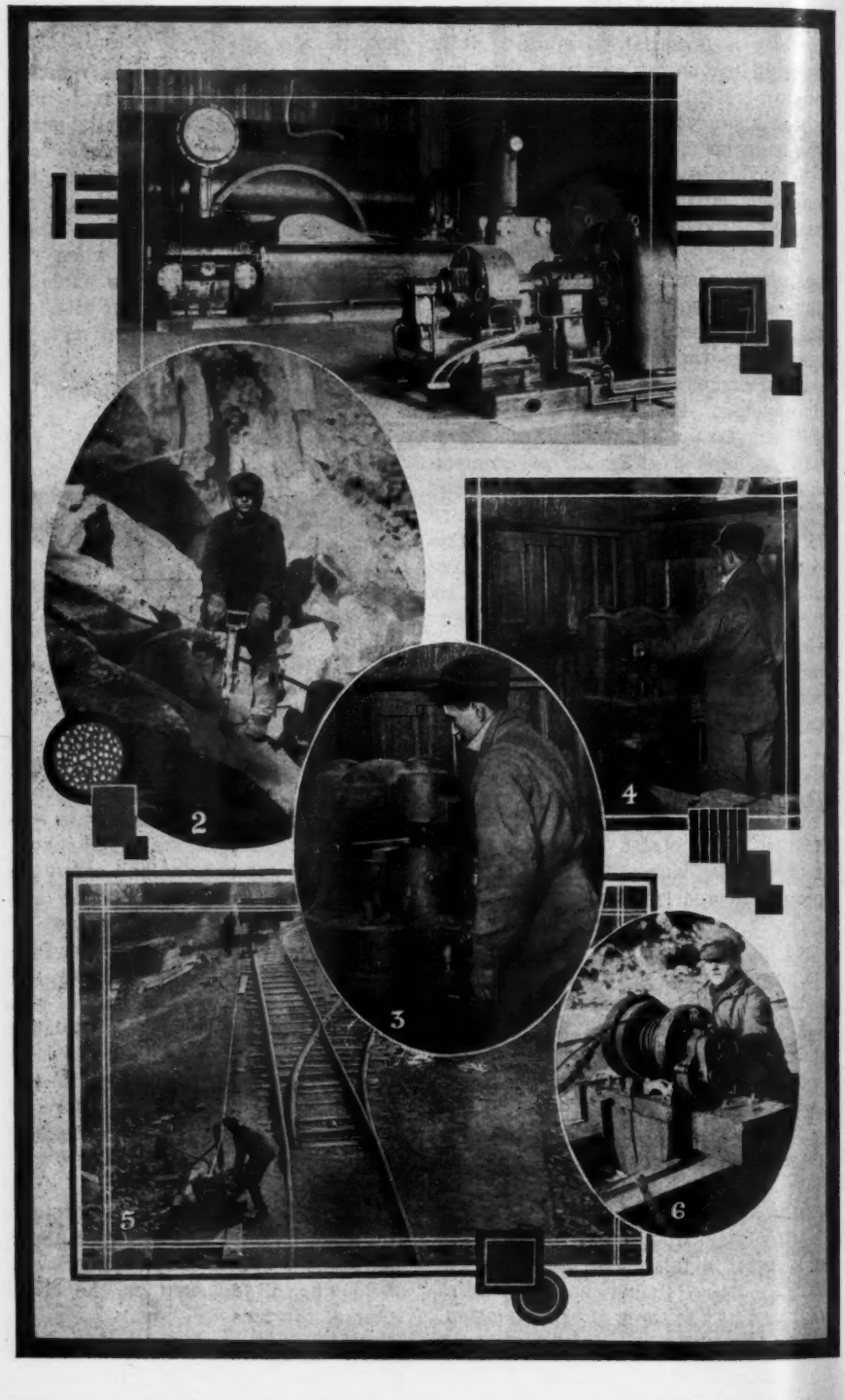
Dynamite Percentage

WE ARE frequently asked "Why are two kinds of dynamite used? We have very good success in using only one percentage."

There seems to be considerable difference of opinion among quarry superintendents and foremen as to whether one or two percentage should be used. Some use one and some use two, while others use both the one and two.

No hard-and-fast rule can be adopted and local conditions will have to determine the manner of loading the holes. Probably the greatest number of quarries use a forty-sixty mix, the sixty per cent being placed in the bottom for the reason that there is generally so much toe there that it requires greater strength to throw it out.

Where the quarry face is straight and high, forty or fifty per cent alone can be used successfully. The method of loading all depends on the character of the face.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Air Compressors and Their Uses

The second of a series of practical articles describing such operations as have been manifestly benefited by the cutting down of labor costs, the increase of production, the solving of difficult operating conditions, or in any manner in which improvement has been made.

ON THE OPPOSITE page is a group of pictures showing to what extent the Lakeland Lake Trap Rock Co., Congers, N. Y., uses compressed air. Number 1 shows an Imperial steam-driven air compressor in the company's typical central air compressing power plant. While the use of steam for compressor drive is frequently the case in isolated plants, in many other cases the compressor is belted to an electric motor or form of drive.

In picture No. 2 is shown the principle use for air in quarrying, namely, the operation of rock drills, in this case, of the jackhammer type. These are used both for shot hole work on the quarry face and as in the picture, for block holding the large masses of rock which cannot be loaded without further breaking up.

Photographs Nos. 3 and 4 depict a Leyner drill sharpener in the act of sharpening the bits on rock drill steels used with the jackhammer drills. This machine operates on compressed air and effects a superior grade of work in the minimum of time.

Pictures Nos. 5 and 6 show a supplementary use for air, namely, the operation on a Little Tugger hoist to haul cars up an incline from whence they run down and switch over by gravity.

All of the compressed air equipment was furnished by the Ingersoll-Rand Company, New York, N. Y.

Great Interest in Road-Builders' Regiment.

Men are coming forward in greater number for the road builders' regiment being formed by Colonel E. N. Johnson than at first, because of the general publication of the work to be required of it. The regiment will be known as the Twenty-third engineers and will afford the opportunity of gaining valuable road-building knowledge in the construction of roads near the front.

Non-commissioned officers will be men who have acted as superintendents or assistant superintendents of highway, bridge or quarry work, or had charge of transportation or mechanical plants; chief clerks on large work, material and stock men, timekeepers, surveyors, draftsmen, powder men, riggers, iron workers and carpenters. They will be paid $40.20 to $96 a month and expenses and their ranks are to be filled exclusively from the rank of private.

U. S. Road Improvements.

There are in use at present a total length of $2,455,761 miles of roads in the United States, of which only 287,000, or 11 6/10 per cent are improved with some form of surfacing. About 15,000 miles of roads are receiving hard surface each year. During 1916 rural roads and bridges consumed $272,634,424.

HERE IS THE MACHINERY COMBINATION THAT ENABLED THE DETROIT EXCAVATING COMPANY TO SAVE ALMOST A DOLLAR A YARD ON SIXTEEN THOUSAND CUBIC YARDS OF EARTH HANDLED ON ONE JOB. NOTE THE TABLE ON THE NEXT PAGE

Motor Trucks Haul Material at One-Third the Cost of Teams

BULKY materials require efficient means of handling and transportation. Frequently deliveries are to be made several miles away and the delivery problem becomes one for individual solution. Many contract jobs present the same delivery features to be encountered by commercial plants producing sand and gravel or crushed stone, so that records established by hauling contractors can serve as a basis for figuring delivery costs by those seeking that kind of information.

BY A STAFF WRITER

THE QUESTION of prompt delivery in any required quantity will determine the sale and the price of material. One simply must make good on deliveries, yet here is where the greatest weakness in the industry is apparent. The average team can manage about a maximum of 1½ tons over ordinary roads, while the average truck easily carries 2½ to 3½ tons under the same conditions. Under favorable circumstances, one or more trailers may be attached to the truck, doubling or trebling its capacity with only a slight increase in operating expense.

That paragon of hauling, the army mule, is capable of only 17 miles a day, while many motor trucks exceed a hundred miles a day. Moreover, the mule requires frequent feeding and resting, which the truck does not. The larger the load carried the fewer loads are required to fill a contract. Reducing the time of loading and unloading to the minimum will allow

more trips to the day and consequently accommodate the regular customers better and take care of new ones. One cannot get new customers without offering advantages, and the motor delivery offers more advantages than any other which the average material man can offer.

While everyone should devote his best energies to his business, there are times when one can use a truck on a side line to good advantages. In the winter, in the cities he can haul coal when his pit is frozen up, and keep the truck in use the greater part of the year. He can make long hauls with ease, and keep his name before the public as a progressive business man. Hardly a day goes by but some new opportunity comes up, in which motor truck delivery cuts a figure. Quick deliveries, distant deliveries, quantities, all can be met with the ever-ready truck.

* * * *

Saving $15,000 On One Jobs

MOTOR TRUCKS saved $15,000 in the excavating cost in one Detroit job alone, according to "Con" Devers, of the Detroit Excavating Company. The work was done at the Henry Ford hospital, at which 16,000 cubic yards of earth were moved. This excavating company often has many big contracts of the above character on hand, keeping several gangs of men and steam shovels engaged at the same time in different localities. Naturally these men know what teams cost and the work they can do, for they used them in the days when there was no better means at hand.

At present a one-horse team with driver can be obtained for $8 a day. The capacity of such an outfit will be 2 yards, while a big dump truck holding over 5 cubic yards at a load will cost $25 a day.

The dumping ground was three miles distant. Both means of hauling were, of course, figured on, and at first it seemed foolish to use motor trucks at a greater cost than teams of $17.00 each per day. But the company found that the horses could only make a six-mile round trip three times daily, while the motor trucks could make ten 6-mile round trips every day.

Therefore, on the certain knowledge of what each kind of haulage would cost, they easily figured out a comparative cost of teams and trucks on the job as follows:

COMPARATIVE COST OF TEAMS AND HORSES

Length of haul, 6 miles.

One Team	
Size of load (cu. yds.)	2
Number of trips per day	3
Total yards per day	6
Cost of hauling 6 yds	$8.00
Cost per yard with horses	1.33
One Truck	
Size of load (cu. yds.)	5.5
Number of trips per day	10
Total yards per day	55
Cost of hauling 55 yds	$25.00
Cost per yard with trucks	.45

The picture shows one of the Federal trucks (Federal Motor Truck Co., Detroit) being loaded by the Thew steam shovel. The truck also performed a notable service in climbing a 20 per cent grade from the excavation under full load and without difficulty.

One Motor Truck Replace Seven Teams

At Grafton, Wis., Louis Hoffman is engaged in hauling crushed stone on the state road at Belgium, using an Acme 3½-ton motor truck. He states that one truck does the work of seven teams, making eleven trips a day over a 4½-mile stretch carrying 3 yards each trip, a total daily tonnage of 33 yards of crushed stone.

As the teams on the same work are

CONTRACTOR HOFFMAN'S TRUCK MADE ELEVEN TRIPS A DAY OVER A FOUR AND ONE-HALF MILE STRETCH, CARRYING THREE YARDS EACH TRIP.

making but three trips, carrying 1½ yards each trip, it would require more than seven teams with seven drivers to equal the hauling capacity of the motor truck.

This truck, by-the-way, is a new model built by the Cadillac Auto Truck Company, Cadillac, Mich. It is a combination dump and stake body mounted on a 3½-ton chassis and combines all the advantages of a standard dump body with those of a standard stake body. For instance, when not used as a dump body the sides are easily removed, four stake gates and the tail gate placed in position, give a standard stake job, available for all kinds of hauling.

The general utility of this body for road work can well be appreciated, giving splendid service in road building and at the same time is instantly available for all the various hauling problems which come up in contracting work where a standard stake body is desirable. A more complete description of this truck will be found on another page.

Government to Seek Best Type of Road.

Under the direction of the United States office of public roads and rural engineering, a three-year program is being devised for the securing of such highway construction data as will enable the bureau to state definitely which is the most economical road, all things considered.

The matter will be gone into in great detail, even to the keeping of a record of the widths of the tires of the vehicles which travel over various types of roads. Total cost data will be gathered, covering both construction and maintenance and will be tabulated in relation to each road's initial cost and maintenance cost, with the idea of arriving at unit road cost per ton mile of traffic.

ASSOCIATION ACTIVITIES

BOYS WHO WON PRIZES AT STOCK JUDGING GIVEN A TWO-DAYS' TRIP TO THE CHICAGO STOCK SHOW BY THE OHIO MACADAM ASSOCIATION. SECRETARY A. P. SANDLES IN THE FRONT ROW AT THE LEFT.

Sandles Brings Prize Winners to Stock Show

Sixty-five Buckeye Boys Given Two Days' Sight-Seeing at Expense of Ohio Macadam Association

ON DECEMBER 4 Secretary A. P. Sandles, of the Ohio Macadam Association, brought 65 boys, ages 12 to 18 years, to the Chicago Stock Show and for a two-days' sight-seeing visit. These boys were prize winners at various county fairs in Ohio in pig raising, corn growing, potato growing and stock judging contests, grain crops and calf clubs, and the trip to Chicago was given as a further reward and intended as a patriotic incentive to boys to take up agriculture and stock raising as a business. The Ohio Macadam Association paid their expenses.

"These boys," said Mr. Sandles, "are growing the nation's meal ticket. They won their trip to the Chicago Stock Show by producing grain, wheat and meat. They deserve encouragement and applause even greater than the prize fighter, race horse driver or ball player. The farm population decreases at an alarming rate; the army of consumption increases, while the army of production decreases; the high cost of living is not an accident. Too often the empty belly is the cause of strikes, riots and unrest.

"In the past sixteen years the population of the nation increased 25,000,000. During that time the nation's food production did not increase pound or bushel. Unless encouragement can be given those who do remain on the farms to intensify agriculture, there will be more bread riots and longer bread lines. The meal ticket is the biggest gun of the army and navy. When boys discover how to increase the yield of the fields they are helping win the war and making one less kaiser in the world. They can be patriotic and follow the flag while they follow the plow and persuade the pig and calf to make pork and beef."

Four other states—Indiana, Wisconsin, Iowa and Virginia—sent delegations and there were about 350 boys in attendance. Next year it is predicted that the number will run into the thousands. Mr. Sandles was chair-

man of the combined meeting of all the states at the Y. M. C. A. hotel Tuesday evening, December 4. He was assisted in handling the boys by Senator Russell, of Sidney, Ohio, and W. D. Hunnicutt, in charge of boys' and girls' club work of the College of Agriculture, Ohio State University, at Columbus.

Practical Subjects at S. & G. Meeting.

Interest in the coming convention of the National Association of Sand and Gravel Producers is growing in a gratifying degree and the plans are speedily being completed. The outstanding feature of the meeting will be its consideration of practical operating methods and every plant owner is urged to bring his superintendent or foreman so that they, too, may learn at first hand the practices of the speakers. Those who will read papers are men who have accomplished much in the capacities of which they will speak, and there will be considerable discussion of the points brought out.

From present indications it is certain that the attendance will greatly exceed that of past gatherings. Three hundred or more visitors are expected. This will be an excellent opportunity to hear, at one time, the best thought and opinion of the industry's most successful men. Other subjects will be given due attention. For instance, the important matters of standardization of grades, cost accounting, busness conditions of the present and future and trade relations will come up in such a way that action of some kind will undoubtedly be taken on them. Every progressive sand and gravel producer should be on hand. The convention will be held at the Great Northern hotel in Chicago on Feb. 7 and 8.

Coming Meetings.

January 9.—Indiana Crushed Stone Association, Claypool Hotel, Indianapolis. F. W. Connell, Secretary. Hume-Mansur building, Indianapolis, Ind.

January 21-30. — Columbus Building Show, Columbus, Ohio. Conducted by Builders' and Contractors' Exhibit and Real Estate Men of Columbus.

January 29-30. — Sand-Lime Brick Association, Lafayette Hotel, Buffalo, New York. Ray C. Kiser, Dayton, Ohio, Secretary.

February 7-8.—National Association of Sand and Gravel Producers, Great Northern Hotel, Chicago, Illinois.. E. Guy Sutton, care Carmichael Gravel Co., Williamsport, Ind., Secretary.

February 7-8-9. — American Concrete Institute. Hotel La Salle, Chicago, Ill.. Henry B. Alford, care Aberthaw Construction Co., Boston, Mass., Secretary.

Connell Appointed Road School Chairman

The county highway superintendents of Indiana at their meeting in Lafayette December 2, decided to have their annual convention and road school at Purdue University, January 29, 30 and 31. F. W. Connell, secretary of the Indiana Crushed Stone Association, Indianapolis, was appointed chairman of the committee. Other committee members are: H. M. McCaskey, Marion; R. I. Williams, Crawfordsville, and L. E. Tex, Indianapolis.

It is the intention of the committee to make this meeting as nearly as possible a practical road school, consisting of morning, afternoon and evening sessions. All the prominent superintendents in the state will appear on the programme. Purdue officials, as in the past, will give the committee their hearty co-operation in making the road school a success.

Urge Road Betterment.

At a meeting of the Illinois Sand and Gravel Producers' Association held in Peoria, December 18, the following resolution was passed:

We, the sand and gravel producers of Illinois, affirm our devotion to our country in this crisis and cheerfully submit ourselves to such rules of conduct in our business as may be necessary to conserve the nation's resources and win the war.

Since, in our judgment, the permanent improvement of our highways and the development of internal waterways will aid in the more prompt shipment of men and materials of war and of industry, we urge upon those in authority the modification of restrictive orders at the earliest possible practicable moment.

We would impress upon all responsible officials and all citizens the urgent need in our state of the betterment of roads and ask for the support of all state and county bond issues that will give us a comprehensive system of permanently improved state and county highways.

Illinois Association of Sand and Gravel Producers,
H. D. Conkey, President.
D. S. Brown, Secretary.

Remarkable Efficiency in Twin Crushing Plant

(Continued from page 57)

½-inch, 1-inch, and 2-inch perforations. The screening department is so arranged that every screen can be thrown out independently. It is here that the dirt is removed from the stones by means of two pumps (Kerr Machinery and Supply Co., Detroit), having a capacity of 500 gallons per minute, being two-stage centrifugals pumping against a 145-foot head and direct connected to a 35 h. p. motor.

Bins stationed under the screens re-

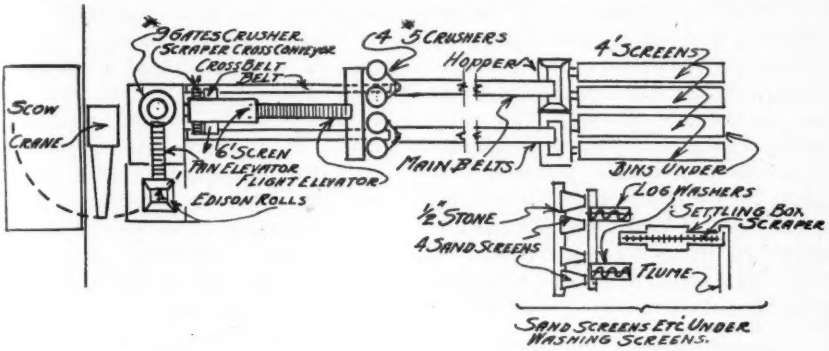
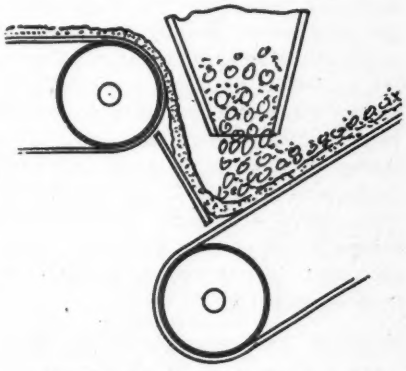


DIAGRAM SHOWING THE FLOW OF MATERIAL THROUGH THE DUNBAR STONE COMPANY'S PLANT.



COARSER STONE FALLS UPON A CUSHION OF FINER MATERIALS, THUS PROLONGING THE LIFE OF THE BELT.

ceive the coarser grades of stone through spouts, but the material ½-inch and under goes to four Stephens-Adamson conical washing screens located below them, having ⅜-inch perforations. From here the ½-inch material goes to its bin and the remainder passes through log washers through conveyors working in troughs set at a steep incline against a downward flow of water. This process removes the "¼-inch washed" sand, and the remaining mixture of sand and water passes through a settling box and incline in which a scraper conveyor is working in the direction of the flow to the sand bin or cars, as the case may be. The water which passes out, however, contains considerable powdered material, and this is chuted to a settling pit adjacent to the plant to be dried and packed as pulverized limestone when enough of it has been accumulated to render this phase of the operations practicable.

Quick Loading Facilities

Under the stone bins are two railroad tracks passing over scales and extending beyond the plant on an upward grade a sufficient distance to hold a number of empty cars. The cars are returned by gravity to the scales and here loaded one at a time from the bins above, usually ten per cent overload of the exact tonnage. Trucks are loaded in the same manner. The writer witnessed one truck loaded in two minutes. There are five switch tracks in the storage yard and over these runs an Ohio locomotive 10-ton crane with a ¼-yard bucket. The company owns four gondolas which are used for transporting material from the plant to the yard.

Tractors and Trailers Haul Full Carload of Material

The delivery department operates

(Continued on page 77)

Cost Keeping for Quarries

(Continued from page 62)

against certain yardage in the ledge or part of the ledge, while the pumping charge should be distributed over a week's, month's or season's output on a unit basis. Thus there may be but little variation in the other items, but considerable in pumping from week to week. The cost of the plant can be included with the quarry plant.

Quarry Plant

The distinction between quarry plant and production plant is readily made. The quarry plant consists of those pieces of equipment that are used directly in the quarry and for transporting the products to the production plant. The list for some quarries is small, for others large, while a general list would be extensive. Some of the principle items are tracks and cars, derricks, cableways, carts and horses, steam shovels, drills of many kinds, and many other items.

The quarry plant will vary somewhat as to the development of the quarry, and although small at first will gradually increase in size. There may be only 400 or 500 feet of track in a new quarry, but within a year this may be increased to nearly a mile. There will be two items of charges, one of operating and maintaining the plant and the other of interest and depreciation and renewals.

The first comes under the operation costs, while the second is a general item that can be worked up and applied over a given period. The writer prefers to include his powder magazine and blasting barriers with his quarry plant, as they are for that part of the work and have nothing to do with the production plant.

Production Plant

Under production plant is included the permanent plant that turns out the quarry products. For crushed stone this is the crushers and their

Remarkable Efficiency in Twin Crushing Plant.

(Continued from page 76)

on a pretentious scale and the company has won a favorable reputation for filling orders with remarkable speed. The equipment in this department consists of two Model 36 Knox tractors with 4-ton bodies which usually pull one or two 12-ton four-wheeled trailers, although trains consisting of a tractor and three trailers hauling a full carload of 40 tons have been frequently hauled. This great amount of material can be conveniently transported in Detroit, where there are few steep grades. The side-dump bodies were manufactured by the Lee Loader Company of Chicago and can be operated by one man. There are also two Model 35 Knox tractors with 11-ton end-dump semi-trailers having Wood dumping hoists and two Model 35 Knox tractors hauling 15-ton semi-trailers with Lee side-dump bodies. In addition to these, two 12-ton trailers are maintained so as to be put into service when necessary. In especially busy times the company delivers by hired motor trucks and maintains a schedule of deliveries kept by a dispatcher who has an office at the loading bins. He checks all weights as the trucks or cars pass over the scales and also delivers the proper tickets to the drivers.

So precise is the mechanical lineup of the plant that six men could operate it, if necessary, although eleven men are usually employed. These are two operators on the crane who work in turn, for this is a position requiring great skill because of the complicated set of levers. There is a foreman at each end of the plant. The company employs fifty men in all, and is managed by E. C. Dunbar.

housing, the bins, conveyors, elevators, power house and equipment, etc., while for a marble quarry there is the mill with the saws, polishers, etc.

The operation of the plant should come under the daily operation costs, while under the general costs should be the interest, depreciation and renewals. The repair shops and blacksmithing, except drill sharpening, should come under the production plant, while the drill sharpening should be in the daily cost of loosening the rock.

Third Federal Apportionment.

The third apportionment of federal funds to the several states for use in the construction and maintenance of rural post roads has been announced by Secretary Houston. This is for the fiscal year ending June 30, 1919, and amounts to $14,550,000. The apportionment is as follows:

Alabama	$313,456.47
Arizona	205,540.58
Arkansas	250,018.47
California	456,167.23
Colorado	257,278.92
Connecticut	92,216.45
Delaware	24,411.99
Florida	170,723.88
Georgia	403,909.45
Idaho	183,471.55
Illinois	658,323.48
Indiana	406,230.18
Iowa	434,653.61
Kansas	429,131.88
Kentucky	292,984.62
Louisiana	203,755.29
Maine	144,807.42
Maryland	130,871.43
Massachusetts	221,261.85
Michigan	435,356.37
Minnesota	425,865.40
Mississippi	268,751.60
Missouri	508,603.98
Montana	298,520.89
Nebraska	319,445.25
Nevada	193,229.82
New Hampshire	62,610.11
New Jersey	177,357.22
New Mexico	238,634.55
New York	749,674.20
North Carolina	342,556.47
North Dakota	229,585.91
Ohio	558,043.42
Oklahoma	346,489.34
Oregon	236,332.74
Pennsylvania	690,145.78
Rhode Island	34,972.38
South Carolina	215,014.08
South Dakota	243,175.61
Tennessee	340,663.51
Texas	876,986.70
Utah	170,763.17
Vermont	68,128.92
Virginia	298,120.77
Washington	216,530.19
West Virginia	159,713.89
Wisconsin	382,707.20
Wyoming	183,805.78

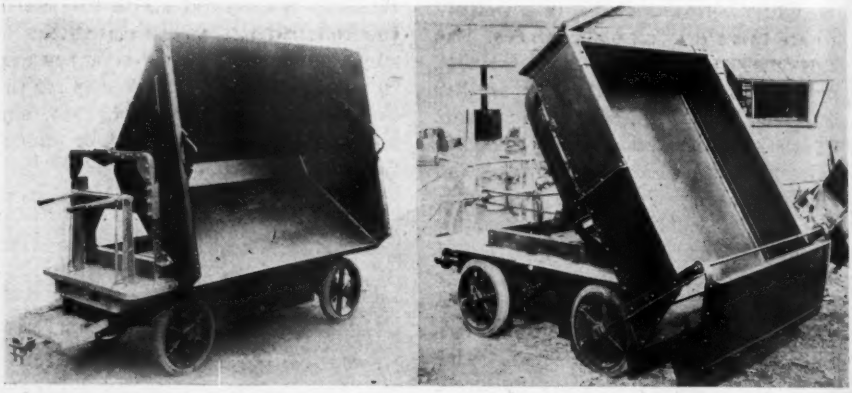
MEN AND MACHINERY

Advanced Type Electric Storage Battery Truck.

AN ADVANCED type of the electric storage battery truck is shown in the accompanying illustration of a cradle dump body mounted on a Type B electromobile manufactured by the Orenstein-Arthur Koppel Co., Koppel, Pa.

The truck proper is of standard electromobile construction with steel channel frame and metal protected oak platform hinged in two parts. The wheels are of cast steel, 20 inches in diameter with 20 by 3 solid rubber Goodrich tires and two Timken bearings to each wheel; Wagner motor with fool-proof Wagner control. Power is furnished by a 24-7 Ironclad Exide battery. The entire frame is supported by four spiral steel springs, thus protecting both load and truck from shock. The wheel base is 52 inches, with a 34-inch gauge.

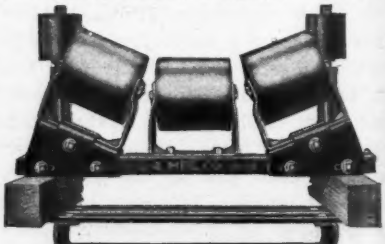
The truck has a capacity of 3,000 pounds and attains a speed of 7. M. P. H. The body is of the self-clearing type with a dumping angle of 40 degrees, and dumping is accomplished from the platform by a simple and trouble-proof machine. Lifting hooks on each end of the body permit it to be removed for access to batteries through a special door in the platform. To gain access to the motor jack shaft and brake it is only necessary to loosen a few bolts to lift off the dump body frame and then open the hinged platform. This truck can be used as a tractor and will pull 10,000 pounds.



STORAGE BATTERY ELECTRIC TRUCK HAS A CAPACITY OF 3,000 POUNDS AND ATTAINS A SPEED OF SEVEN MILES AN HOUR.

Unit Carriers Are Labor Savers.

BELT conveyors successfully meet the requirements of pit and quarry operations, and their development has been of utmost import in the efficient production of gravel and stone. The master key to the success of a belt conveyor is the carrier. The S-A unit carrier, manufactured by the Stephens-Adamson Mfg. Co., is pictured here. Individual units comprising steel pulley, shaft, bearings and steel



UNIT CARRIER FOR BELTS TWELVE TO SIXTY INCHES IN WIDTH.

stand, are arranged and mounted on steel channels in any desired number to make up a carrier for belts ranging in width from 12 to 60 inches. The concentrator units are identical with the carrying units.

The dust-proof ball bearings insure smooth, easy running qualities which minimize belt wear and reduce the horsepower required to operate the conveyor. These bearings are designed to be packed with grease and will operate without attention for six months.

Sarco Enlarging Their Business.

The Standard Asphalt & Refining Company of Chicago, Ill., has purchased the plants, trademarks and good will of the Sarco Petroleum Products Company. The Cities Service Company, of 60 Wall street, New York City, is the new interest in back of this company, although the management remains essentially the same as before the change. Charles Muller, who was an executive of the former company, now becomes manager. He has been associated with the old company for ten years, has risen through the ranks to his present position and is well known in business and financial circles in Chicago.

Robert F. Trumbull, has been promoted to manager of the Railway and Building Materials department. He has been in the service of the old company for eight years in this department. By constant contact with the trade during that time he is intimately acquainted with its requirements for asphalt materials. The indications are that the new company will be much more active than the old and that its facilities for serving the trade will be greatly increased, due to the extensive control of crude materials possessed by the Cities Service Company.

New Portable Carbide Light.

THE NEW Milburn portable carbide lights show a decided departure in construction principles in the carbide container, as illustrated in the picture accompanying this article. The pockets are shaped like an inverted cone, arranged around a central axis, after the fashion of a spiral staircase. The water, as it enters the cylinder surrounding the carbide container, comes in contact with the bottom point of the lowest of these pockets, and as this carbide is used up, the second pocket, slightly higher, becomes affected by the water, and so in turn. The generation is constant.

This new construction admits of absolutely no over or after-generation. When the light is turned out, the water is expelled immediately from the carbide chamber. The Government has bought them for use in France, where they will play an exceedingly important part in construction of roads, bridges and other work behind the lines.

We Are the Pioneer Manufacturers of Gravel Washing Machinery

The first gravel washing plant was an "S-A" Plant. We developed the original gravel washing machinery which is still recognized as standard. In fact, the records will show that we actually developed the industry.

Altogether in the past fourteen years we have designed and equipped about 400 gravel washing plants. Each one of these was especially designed—each one has been a *commercial success*. We have turned down orders for a number of plants where the elements of success where lacking. We have turned failure into success for several others by re-equipping with "S-A" Machinery.

We have a strong organization of engineers—and a large plant devoted to the manufacture of the highest grade of conveying elevating, screening and transmission machinery.

It is to your interest to deal with manufacturers and not jobbers

"Ask the Man Who Owns One"

The following is an incomplete list of the newer "S-A" plants

Gravel Washing

Los Angeles Rock & Gravel Co.
Scottsville Sand & Gravel Co.
Montana Concrete Co.
Vandalia Railroad.
Standard Builders' Supply Co.
Hawarden Sand & Gravel Co.
H. D. Conkey Sand & Gravel Co.
F. A. Downs Construction Co.
Mason City Sand & Gravel Co.
Jensen & Jensen.
Virginia Sand & Gravel Co.
L. D. Burd.
Wabee Gravel Co.
Summit Sand & Gravel Co.
Geo. J. Hoffman.
Logansport Gravel Co.
Battjes Fuel & Supply Co.
Wabash Sand & Gravel Co.
Macksville Gravel Co.
Mason City Sand & Gravel Co.
Covington Sand & Gravel Co.
American Agricultural Chemical Co
Madison Construction Co.
Windsor Sand & Gravel Co.
Atwood Davis Sand Co.
Lake County Gravel Co.
Chas. Vivian.
Vigo Washed Sand & Gravel Co.
Interstate Material Co.
H. W. Hawly.
Wabash Sand & Gravel Co.
Kingsley & Pagant.
Pueblo Bridge.
Minden Gravel Co.
C. H. Billings.
Canada Sand & Gravel Co.
C. H. Little & Co.
Beaver Sand Co.
McCraney Sand Co.
Coon River Sand Co.
Downs Construction Co.
Virginia Sand & Gravel Co.
Chicago Gravel Co.
Hoyt Mining Co.

Stone Washing

Brownell Improvement Co.
Peoples Crushed Stone Co.
U. S. Crushed Stone Co.
Big Rock Stone & Const. Co.

"S-A" Equipped Crushing Plants

A. C. Laughlin Stone Co.
France Stone Co.
General Crushed Stone Co.
National Lime & Stone Co.
Bessemer Limestone Co.
Branchton Limestone Co.
Blair Limestone Co.
Standard Lime & Stone Co.
Union Lime Co.
Elmhurst & Chicago Stone Co.
Leathem & Smith.
Greenleaf Stone Co.

We'll gladly supply the address of any of the above for reference or send names of "S-A" plants in your territory

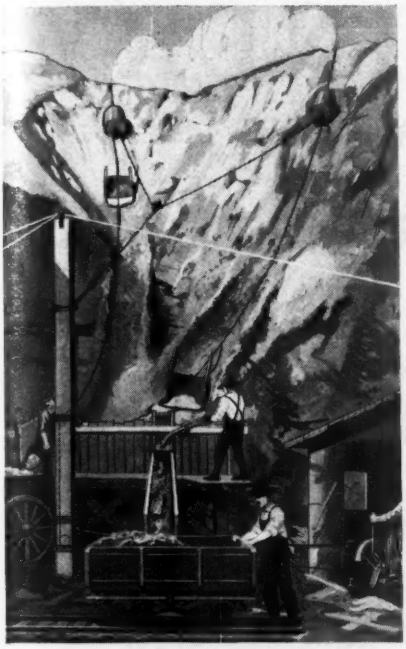
Put your proposition up to us and we'll help you make it pay

Stephens-Adamson Mfg. Co.

Aurora, Ill.

Labor Saving Excavator.

A LABOR saving outfit designed for excavating sand and gravel from banks has been placed on the market by the Ideal Engine Co., 615 East Kalamazoo street, Lansing, Mich. The material is excavated by scrapers sus-



ONE SCRAPER DIGS WHILE THE OTHER DISCHARGES INTO A BIN.

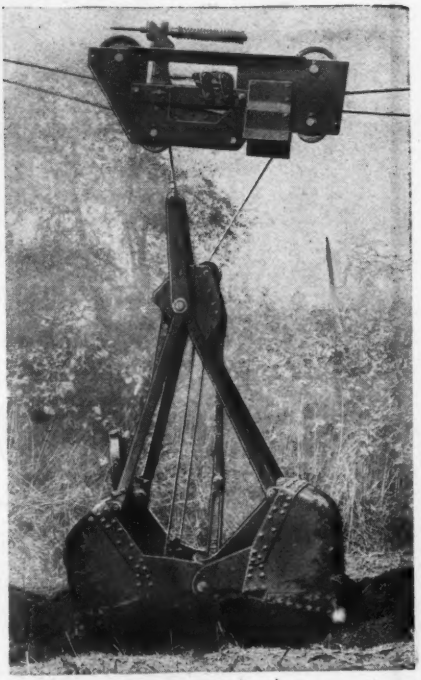
pended from a cable, and so arranged that while one scraper is digging, the other is discharging its load into a bin, from when the material can be loaded direct into wagons or conveyed by chain buckets to screens. The power for operating the scrapers is obtained from a 2-drum hoisting machine driven an 18 h. p. engine. The only manual labor required in excavating is one man to operate the hoist levers.

Locking Cableway Carriages.

USERS of cableways operating scraper buckets or self-dumping skips loaded by hand frequently desire to substitute a self-loading bucket in order to extentd the usefulness of the cableway.

The Blaw locking cableway carriage permits standard Blaw clamshell buckets to be used upon any ordinary cableway designed for hand-filled buckets, without changing the cableway engine or running additional hoisting or holding lines. It also enables the user to construct a cableway upon which a standard Blaw clamshell bucket may be operated by an ordinary two-drum non-reversing hoisting engine.

The principle employed is to lock the carriage, automatically, to the supporting cable (when the bucket is being raised, lowered, opened or closed in the usual manner) by means of two hoisting lines; and to unlock the carriage by hanging the bucket upon it (when the carriage is to be moved along the cable), one hoisting line then serving to pull the bucket in one direction and the other hoist-

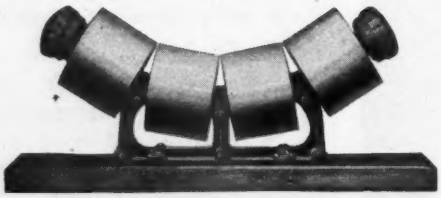


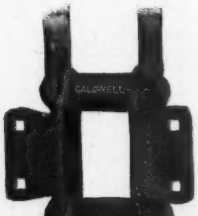
CABLEWAY CARRIAGE AVOIDS CHANGING OF ENGINE OR RUNNING ADDITIONAL HOISTING OR HOLDING LINES.

CALDWELL MACHINERY

FOR HANDLING

Stone, Gravel, Sand





Screw and Belt Conveyors, Steel Elevator Casings and Buckets, Gears, Cut and Cast Teeth, Link Chain Belting, Shafting, Pulleys, Sprocket Wheels, Etc.

H. W. CALDWELL & SON CO.

CHICAGO

Western Ave., 17th to 18th Sts.

ing line to pull it in the opposite direction, as desired.

The bucket used in connection with this carriage is a standard Blaw with extra bales for suspending it upon the carriage. These carriages are furnished for use on existing cableways or for new installations by the Blaw-Knox Co., Pittsburgh, Pa.

Lights Use Ordinary Carbide.

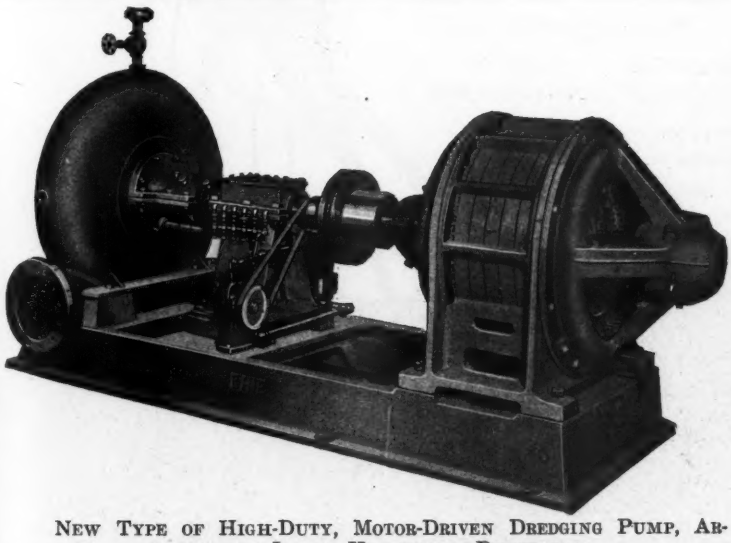
IN THESE days when workmen are scarce any machine that will decrease labor is of interest. The Macleod Co., of Cincinnati, Ohio, is making a carbide light, sold under the names of the "Buckeye" and the "Challenge." It will use ordinary carbide that can be purchased almost anywhere. These lights, with the exception of the "Challenge," have in the base of the tank a gas cleaner or filter which washes, cools and purifies the gas. They are made in a variety of designs to suit special work, for hand lamps and for headlights on locomotives. For the last use an important improvement in the headlight is a provision made for rough jolting, such as a contractor's locomotive gets all the time.

The tank is made very heavy. The condenser is made from a casting and hence cannot become unsoldered, because it has no seams. The base is divided into four chambers, each of the same level. The same quantity and quality of light is produced at all times. The fittings are mostly standard pipe fittings and are procurable everywhere. The cost of operation is less than 1 cent per 1,000 candle power. By the use of extra cylinders, the capacity in length of hours can be carried on continuously.

Motor Driven Dredging Pump.

THE economical handling of sand and gravel at this present crisis in the world's history may seem of small moment compared with the vast National program now under way, but when we consider the large amount of building now going on in certain sections of the country, the rapid and economical production made possible by a modern motor or steam-driven dredging pump may become a matter of no small importance.

The accompanying cut of a new type of high-duty, motor-driven dredging pump brought out during the past few months by the Erie Pump and



NEW TYPE OF HIGH-DUTY, MOTOR-DRIVEN DREDGING PUMP, ARRANGED FOR LOWER HORIZONTAL DISCHARGE.

Digging Deep For Its Load

Filled—and then some—at every grab—the "Blaw." Bucket works *far in excess of its rated capacity.*

"Claw" Buckets

are tremendous cost cutters in any material where a bucket can be used. Added to the economy secured by its speed in digging and handling materials, there is *the big saving due to low maintenance cost.*

In stock, for prompt shipment, are "Blaw" Buckets for every need of the contractor.

Write for the "Blaw" Bucket Book

Blaw-Knox Company

605 Farmers Bank Building
PITTSBURGH, PA.

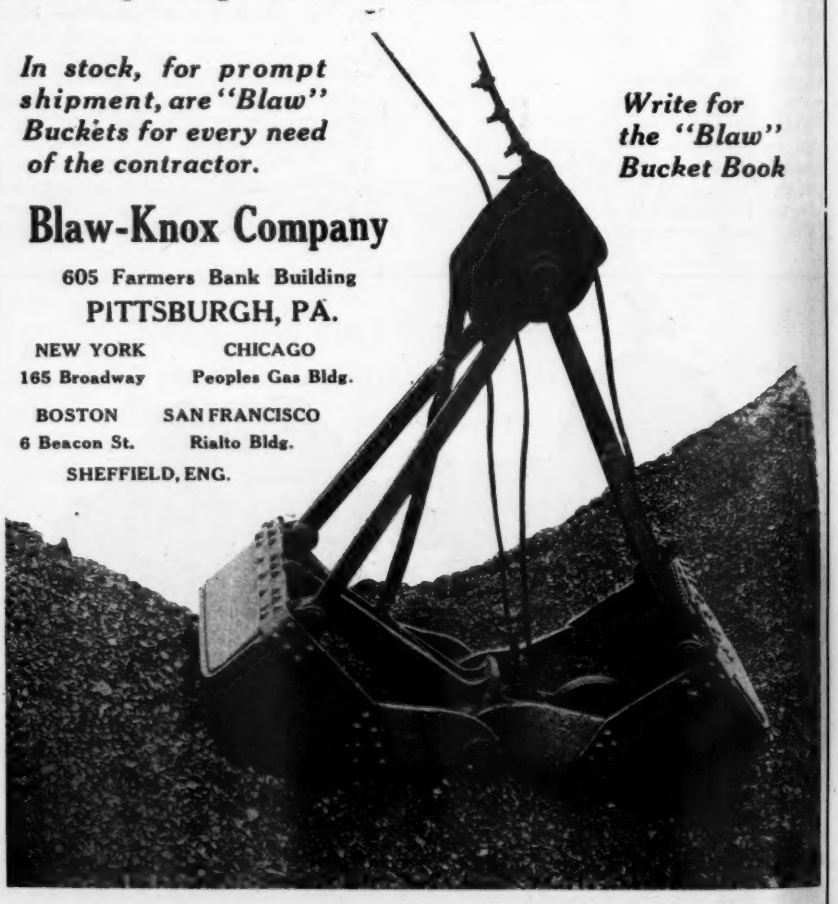
NEW YORK
165 Broadway

CHICAGO
Peoples Gas Bldg.

BOSTON
6 Beacon St.

SAN FRANCISCO
Rialto Bldg.

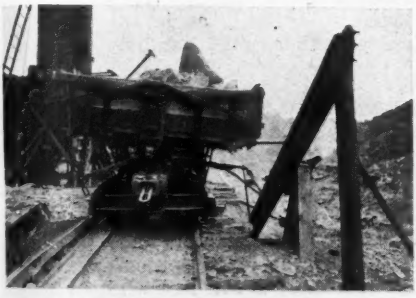
SHEFFIELD, ENG.

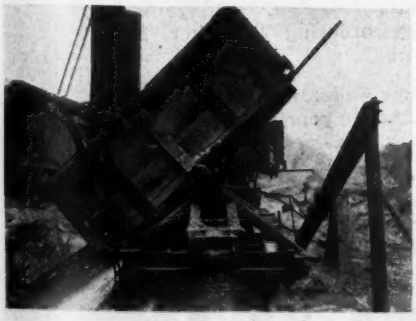


Engine Works, Inc., of Medina, N. Y., is of considerable interest to users of this type of equipment. The pump shown is arranged for lower horizontal discharge and is equipped with a special water cooled marine type of thrust bearing supplied continuously with oil under pressure from a small gear pump belt driven from the main shaft of the pump. A unit sight feed oiler, placed on the side of the thrust bearing, makes it possible at all times to see that oil is being fed continuously to the bearing.

Car Dumping Device.

A WESTERN quarry is using the Druecker automatic car dumping device pictured here. Severe tests were given it and it is claimed that it more than performed the duties expected of it, and that it is a time and labor saver. The dumping device can be placed upon cars up to 16 cubic yards' capacity and 4 cars can be dumped in from 9 to 12 seconds and righted ready for loading in 5 seconds, as brought out by the tests.

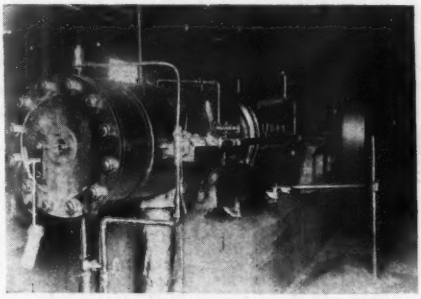




The train does not stop during the entire operation; neither is any workman required beyond the engineer. The dumping point can be changed to any point along the track in about 10 minutes' time. The dumping device for industrial cars is sold by the American Investment Co., of Washington, D. C. It was designed by Jos. M. Druecker, of Kokomo, Ind.

Oil Engine Shows Saving Over Current.

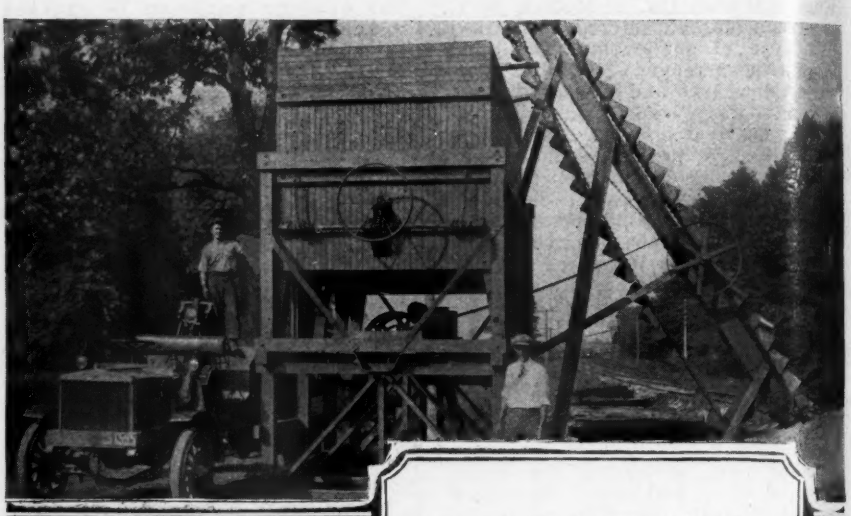
THE PICTURE shows an 85 h. p. Primm oil engine in the plant of the National Quarries Co., Carey, O.,



which is saving that concern over $100 per month in driving the pump, in comparison with a flat rate of 2 cents per kilowatt for local electric current. The engine is on the floor of the quarry, enclosed in a small engine room, making it difficult to obtain a good photograph. It is used for driving an 8x8 Cameron double section centrifugal pump exclusively. It may also be used for furnishing power for screens, bucket elevators, etc. The Primm oil engines are manufactured by the Power Manufacturing Co., Marion, O.

Combination Dump and a Stake Body.

ON ANOTHER page is shown a picture of the new combination dump and stake body Acme motor truck built by Cadillac Auto Truck Co., Cadillac, Mich., having dump and stake body sides interchangeable. The dump body sides and stationary battlements, which are supported by lifting arms, are constructed of extra heavy rolled steel, reinforced with angles. The tail gate is of steel and may be regulated to permit material



The above three and one-half ton Federal is being used by Wheeler & Dreher, Atlantic City, to complete a paved road from Philadelphia to Washington, D. C.

Road Building Work Proves Federal Stamina

In few lines of work is the stamina of a motor truck tested so severely as in the heavy work of road building.

Because of their sturdy construction, economy and day-after-day reliability, Federals are used extensively in this type of work.

That their performance is uniformly satisfactory is proved by the large percentage of owners in this line who increase their haulage fleet by ordering "Another Federal."

Let Federal traffic engineers analyze your haulage problem for you.

Federal Motor Truck Company
441 Federal Street
DETROIT - - MICH.

FEDERAL

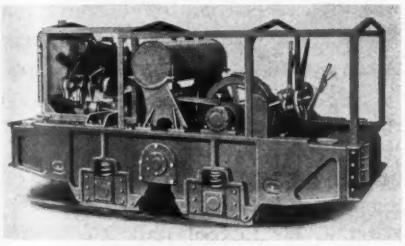
One to Five Ton Capacities

to be spread as the truck moves along. When not in use as a dump body, the steel sides and tail gate are instantly removable.

Stake gates 36 inches high may be substituted, with a truck body tail gate which hinges on the bottom. Reinforced wood tail gates 18 inches and 24 inches when lowered extend the platform 10 and 12 feet in 2 and 3½ tonners respectively. The subframe is built of rolled steel channel securely riveted. For 2-ton a 1⅜-inch stake body floor is used, while a 1¾-inch is for the 3½-ton Acme. These floors are covered with 14-pound steel plates, fastened with bolts. All corners are rounded where possible.

Gasoline Locomotives.

THE WHITCOMB friction drive gasoline locomotive, low type, is built in gauges 18 to 56½ inches. The picture shows the locomotive with side plates and top cover removed so that the working parts may be seen. Other types, with gauges 16 to 42 inches, are made. Gasoline locomotives in sizes of 2½ to 20 tons are being manufactured for quarries, sand and gravel pits, contractor's work, etc., the usual size being 3, 4½ and 6½ tons for such purposes. They may be had with either enclosed or open cab.



The cooling system is of the approved automobile type of heavy truck radiator, in connection with centrifugal pump circulation. Attention is called to the over-size friction and fiber face discs. The engine is a 4 cylinder vertical. Self-starting outfits are on all locomotives and an arrangement for burning kerosene may be obtained at small extra cost. The horsepower is 23 to 50, and a speed up to 12 miles an hour may be attained. The gasoline tank holds 25 gallons. The locomotives are manufactured by the Geo. D. Whitcomb Co., Rochelle, Ill.

The American Pulverizer Company has moved its general and sales offices, factory and new experimental laboratory to Eighteenth and Austin streets, St. Louis, Mo.

Plymouth Cordage Company, North Plymouth, Mass., is erecting new buildings capable of storing 200,000 bales of fibre and 50,000,000 pounds of rope and twine. One seven-story warehouse will be 302 feet long and 100 feet wide. Another warehouse will be three stories high, 302 feet long and 85 feet wide. These large structures were made necessary by the uncertain transportation situation.

H. M. Lee, president of the Duplex Truck Co., predicts a shortage of motor trucks during 1918. He recently investigated business conditions in the South, and believes that if the government places an embargo on the shipment by freight of the 500 products and commodities recommended by the War Board, motor trucks will be pressed into service for the transportation of these luxuries and semi-necessities.

The Blaw-Knox Co. held its annual salesmen's convention in Pittsburg during three days of the later part of November. Special trains carried the party to the plants at Hoboken and Wheatland, Pa. L. L. Knox, inventor of water cooled equipment for furnaces, gave a series of interesting talks on the subjects of water cooled doors, door frames, ports, reversing valves, etc. The principle speakers were Albert C. Lehman, Irvin F. Lehman, F. M. Bowman, L. L. Knox, Wm. C. Coffin, Benj. L. Hirschfield, and Wayne Rawley.

The King Trailer Company, Ann Arbor, Mich., has now occupied its new building of 60 by 160 feet of brick, steel and concrete construction throughout. The erecting of the structure was done in record-breaking time, requiring only twenty-four days. However, it is substantially built, the foundation being of concrete and the walls are brick below sills laid in cement mortar. The columns are structural steel and the roof is of the same material with I-beams set horizontally. The floor is concrete. Ventilation is provided by four light ventilators located in each section of the sash.

How to Attach Wire Rope Sprockets

(1) Separating Wires, (2) Before Wires Are Separated, (3) Ready for Socket, (4) Ready for Spelter.

AT A DISTANCE from the end of the rope equal to the length of the basket of the socket, serve the rope securely with wire for a distance of at least the diameter of the rope. Open the rope and cut out the hemp core. Separate the wires, which can conveniently be done by using a small piece of pipe, as illustrated. Clean the wires well with kerosene or turpentine and wipe thoroughly dry. Immerse the wires five minutes in a solution of half muriatic acid and half water, then clean them off. Next dip the wires in a solution of one-third muriatic acid and two-thirds water. Then bring the wires together and bind with a small wire at the extreme end as shown.

Clean the inside of the barrel of the socket with kerosene or turpentine, and wipe dry. Next coat the inside of the socket barrel with a solution of half muriatic acid and half water, allow this to dry of itself, after which heat the socket until it becomes warm, but not hot; then apply to the inside of the barrel a second solution consisting of one-third muriatic acid and two-thirds water.

Force the socket over the wires and remove the small wire binding at the end of the rope. Next bring the ends of the wires even with the top of the basket of the socket, and allow the wires to spread in the bowl of the socket. Place some fire clay or wrap paper around the rope at the base of the socket to prevent spelter from running out. Hold the socket and rope vertical, and pour melted zinc into the basket of the socket until tops of all the wires are covered. Allow the zinc to cool while the socket is in a vertical position.

The above method has been thoroughly tested by A. Leschen & Sons Rope Co., St. Louis, Mo.

PERFORATED METALS and SCREENS OF ALL KINDS
MATERIAL IN STOCK
PROMPT SHIPMENT
Chicago Perforating Co
2445 West 24th Place
Tel. Canal 1489 CHICAGO, ILL.